Claims

What is claimed is:

1. A method for producing a matched coating composition for a specified end-use, said method comprising:

5   (i) measuring reflectances of a target portion of a target coating at a set of preset wavelengths with a spectrophotometer of a coating characterizing device to plot a target spectral curve of said target portion;

(ii) calculating target color (L,a,b or L,C,h) values of said target portion from said target spectral curve of said target portion;

10   (iii) selecting one or more preliminary colorant combinations from a stored list of known colorants in accordance with a combinatorial selection criteria to match with said target color values;

(iv) determining concentration of each said known colorant in each of said preliminary colorant combinations in accordance with color

15   matching criteria wherein said concentration of each said known colorant is optimized for optimal match of color values of each of said preliminary colorant combinations with said target color values;

(v) balancing said preliminary colorant combinations to allow for the presence of non-colorant components in said matched coating

20.   composition to generate one or more viable combinations optimized in accordance with mixing and regulatory criteria developed for said specified end-use; and

(vi) selecting an optimal viable combination from said viable combinations in accordance with an acceptability equation for said

25   specified end-use, said optimal viable combination having an optimal acceptability value for said specified end-use wherein said known colorants and non-colorant components when mixed in accordance with said optimal viable combination produce said matched coating composition that when applied as a matched coating visually matches with

30   the appearance of said target coating.

2. The method of claim 1 further comprising displaying on a screen of a monitor of said device said optimal viable combination.

3. The method of claim 1 further comprising mixing said components of said optimal viable combination to produce said matched coating composition.

4. The method of claim 1 further comprising applying said matched coating composition over a substrate to produce said coating that visually matches the appearance of said target coating.

5. The method of claim 4 wherein said substrate is an automotive body.

6. The method of claim 1 wherein said matched coating composition is an OEM automotive paint, refinish automotive paint, architectural paint, industrial coating composition, powder coating composition, printing ink, ink jet ink, nail polish, food colorant, eye shadow, or hair dye.

7. The method of claim 1 wherein each of said preliminary colorant combinations comprising one to seven said known colorants.

8. The method of claim 1 wherein said step (ii) comprises:

(a) directing a beam of light of a known intensity towards said target portion; and

(b) sequentially measuring at at least one aspecular angle said reflectances of said target portion at said set of preset wavelengths.

9. The method of claim 1 wherein said step (ii) comprises:

(a) sequentially directing one or more beams of light of a known intensity at at least one incident angle towards said target portion; and

(b) sequentially measuring at an aspecular angle said reflectances of said target portion at said set of preset wavelengths.

10. A matched coating composition produced by the method of claim 1.

11. A color characterizing device for producing a matched coating composition for a specified end-use, said device comprising:

(i) a spectrophotometer of said device having a base for positioning said spectrophotometer over a target portion of a target coating;

(ii) means for calculating target color (L,a,b or L,C,h) values of said target portion;

(iii) a computer usable storage medium located in a computer of said device having computer readable program code means residing therein, said computer readable program code means comprising:

5   (a) means for configuring computer readable program code devices to cause said computer to select one or more preliminary colorant combinations from a stored list of known colorants in accordance with a combinatorial selection criteria to match with said target color space values;

10   (b) means for configuring computer readable program code devices to cause said computer to determine concentration of each said known colorant in each of said preliminary colorant combinations in accordance with color matching criteria wherein said concentration of each said known colorant is optimized for optimal match of color values of each of said preliminary colorant combinations with said target color values;

15   (d) means for configuring computer readable program code devices to cause said computer to balance said preliminary colorant combinations to allow for the presence of non-colorant components in said matched coating composition to generate one or more viable combinations optimized in accordance with mixing and regulatory criteria developed for

20 said specified end-use; and

      (e) means for configuring computer readable program code devices to cause said computer to select an optimal viable combination from said viable combinations in accordance with an acceptability equation for said specified end-use, said optimal viable combination having an optimal

25 acceptability value for said specified end-use wherein said known colorants and non-colorant components when mixed in accordance with said optimal viable combination produce said matched coating composition that when applied as a matched coating visually matches with the appearance of said target coating.

30   12. The device of claim 11 further comprising means for configuring computer readable program code devices to cause said computer to display on a screen of a monitor of said device said optimal viable combination.

13. The device of claim 11 further comprising:

(a) means for configuring computer readable program code devices to cause said computer to generate a signal in accordance with said optimal viable combination to dispense said components for making a
5   desired amount of said matched coating composition;

(b) a dispenser for dispensing said components in a container, said dispenser being in communication with said computer;

(c) means for configuring computer readable program code devices to cause said computer to generate a signal upon completion of making
10   said desired amount of said matched coating composition; and

(d) means for configuring computer readable program code devices to cause said computer to generate a signal to said dispenser to stop dispensing of said components.

14. The device of claim 13 further comprising a mixer for mixing
15   said components dispensed in said container.

15. The device of claim 11 wherein said device is a transportable device.

16. A portable computer usable storage medium having said computer readable program code means of claim 1 stored therein.
20   17. The portable computer usable storage medium of claim 8 wherein said medium is a CD-Rom.

18. The device of claim 11 wherein said spectrophotometer is a multi-angle spectrophotometer.

19. The device of claim 11 wherein said spectrophotometer is a
25   sphere geometry spectrophotometer.

20. A method for producing a matched resin for a specified end-use, said method comprising:

(i) measuring reflectances of a target portion of a target substrate at a set of preset wavelengths with a spectrophotometer of a coating
30   characterizing device to plot a target spectral curve of said target portion; (step by user)

(ii) calculating target color (L,a,b or L,C,h) values of said target portion from said target spectral curve of said target portion; (part of step to done by user)

(iii) selecting one or more preliminary colorant combinations from a stored list of known colorants in accordance with a combinatorial selection criteria to match with said target color values; (in device/computer)

(iv) determining concentrations of each said known colorant in each
5   of said preliminary colorant combinations in accordance with color matching criteria to generate one or more intermediate colorant combinations of said known colorants wherein each of said intermediate colorant combinations is optimized for optimal color match with said target color values;

10 (v) balancing said intermediate colorant combinations to allow for the presence of non-colorant components in said matched coating composition to generate one or more viable combinations of said known colorants, wherein each of said viable combinations is optimized in accordance with mixing and regulatory practices developed for said
15 specified end-use; and

(vi) selecting an optimal viable combination from said viable combinations in accordance with an acceptability equation for said specified end-use, said optimal viable combination having an optimal acceptability value for said specified end-use wherein components in said
20 optimal viable combination when mixed produce said matched resin that when formed as a matched substrate visually matches the appearance of said target substrate.

21. The method of claim 20 further comprising:

(a) mixing said components in said optimal viable combination with
25 a resin to produce said matched resin; and

(b) processing said matched resin into said matched substrate.

22. The method of claim 21 wherein said processing step comprises injection molding, blow molding, rotational molding, thermoforming or extruding of said matched resin.

30 23. A matched resin produced by the method of claim 20.

24. The method of claim 20 wherein said matched substrate is a dashboard or interior door panels of an automobile and said target substrate is automobile upholstery.

25. The method of claim 20 wherein said matched substrate is automobile bumper guard and said target substrate is autobody.